IDENTIFICATION OF SUGAR HONEY, MULTIFLORAL HONEY AND HONEYDEW HONEY BASED ON MINERAL CONTENT, TOTAL ASH PH VALUE AND ACIDITY

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Introduction

Honey is preferred because of its flavour, aroma, appearance, nutritional value. It is possible to find many kinds of honey on the market obtained from different sources so the basic components such as water, reducing sugar, minerals, total acids might be changed from region to region.

Honey is more expensive on market than many similar food. Also there are big differences between the prices of honeys. In Turkey, it is possible to sell some honeys which come from certain local district times more expensive than the others. Honey is also considered as medicine by a great number of people. For these reasons consumers are usually suspicious about the origin of the honeys. In addition there is an ecological and climatic diversity in different parts of Turkey. Eastern Anatolia is a typical part with high plateaux and a long harsh winter but it is very rich with many kinds of flower. There is also a Mediterranean climate in the South and a rainy and humid climate along the Black Sea coast. Moreover there are some micro climatic regions in the valleys surrounded by mountains, parallel to both The Black Sea and The Mediterranean Sea.

Honeys produced in Turkey are usually honeydew honey, multifloral and unifloral (sunflower, citrus, cotton etc.) honeys. The most preferred or the most expensive is multifloral honey. However beekeepers might feed their colonies with sugar syrup when the nectar is not enough or when they want to obtain more product. It seems that the most important problem for the consumers is to be able to know if honey is natural or artificial.

The aim of this study is to identify the type and the origin of the honeys by using a very fast and inexpensive method. As a matter of fact SALINAS et al. (1994) used to find out the origin of the honey by using water content, pH, electrical conductivity, colour, sugar and mineral content values, FELLER-DEMALSEY (1990) used mineral content to identify the origin of honey; SANCHO et al. (1991) used total acidity, formol number, sucrose, glucose/fructose rate; SANZ et al. (1995) reported that mineral content, electrical conductivity and total ash value can be used to determine the different honeys.

Material and Methods

Material

In this study 16 colonies belonging to the Unit of Apiculture of the Agriculture Faculty of the Mediterranean University were used. These colonies were separated into four groups and each one included four colonies. The groups of colonies were placed as follows:

1. Group: On the coast of the Mediterranean Sea. Dominant flora is citrus, eucalyptus etc.

2. Group: On a plateau 80 km away from the sea and the altitude is 1300 m. Dominant flora is multifloral.

3. Group: On a local area of Aegean region covered by pine trees.

4. Group: Kept in the University campus located in Antalya and fed with sugar syrup (1:1 w/w).

Just before the main nectar flow marked frames were put in each hive. After three months, honey obtained from these frames was used for analyses. Sugar honey was produced during September and October because at that period of the year the nectar is very short in this area.

Honey samples were kept at ambient temperature in glass jars in dark.

Method

In the honey samples, pH value, total soluble matter, and total acidity were measured according to CEMEROGLU (1992); total ash and mineral contents were determined according to KACAR (1972) by using Atomic Absorption Spectrophotometer (Varian Spectra A, 550).

Obtained data were analysed by using simple variance analysis and discriminant analysis (SPSS-X, 1986).

Results and Discussion

The content of total ash, total acidity, K, Fe, Mn, and Mg were lower ($p<0.01$) in sugar honey than the content of the other honeys (Table 1). However there was not any significant ($P<0.05$) differences for the other criteria (total soluble matter, pH, Ca, Zn, Cu) between the sugar honey and the other honey samples. This is valid as long as the colonies are fed with intensive sugar syrup. If the bees are able to find some nectar in nature and fed with sugar syrup at the same time, then the honey would be similar to the flower honey and it would be more difficult to determine the differences.

The first aim of the study was to be able to define the sugar honeys and the second one was to differentiate honeydew honey and flower honey as well. Total ash and some minerals contents of honeydew honey were significantly ($p<0.01$) higher than the flower honeys. The mean values of total ash content, pH, K, Mg and Cu were found as 0.41%, 4.41%, 2038 mg/kg, 43.02 mg/kg and 1.17 mg/kg respectively for the honeydew honey and these values were higher than the values of sugar and flower honeys (Table 1).

Table 1

Variance Analysis and Duncan Results of Honey Characteristics

	Group 1	Gropup 2	Group 3	Group 4
	X±Sx	X±Sx	X±Sx	X±Sx
K	873.3±80.6b	668.1±29.7b	2038±137a	116.3±1.48c
Na (mg/kg)	78.94±3.83a	47.98±4.88b	27.69±3.1c	30.81±2.46c
Ca (mg/kg)	265±17.2a	154.1±18.5b	127.4±20.05b	149.8±2.4b
Fe (mg/kg)	7.659±0.22a	5.306±0.99a	6.260±1.46a	0.471±0.108b
Mg (mg/kg)	31.41±0.76b	24.59±1.43c	43.02±2.27a	14.98±0.93d
Mn (mg/kg)	0.950±0.01a	0.711±0.03b	0.962±0.07a	0.124±0.01c
Zn (mg/kg)	1.940±0.29	1.090±0.35	3.423±0.88	2.195±0.39
Cu (mg/kg)	0.381±0.05b	0.393±0.07b	1.170±0.22a	0.450±0.15b
Total ash (%)	0.201±0.01b	0.175±0.01b	0.410±0.02a	0.060±0.01c
Soluble solid (%)	79.00±0.14c	81.75±0.14a	81.44±0.06a	79.87±0.12b
pH	3.8±0.02b	3.7±0.01c	4.4±0.04a	3.6±0.05c
Acidity (meq/kg)	27.57±0.31a	27.52±0.42a	20.83±0.45b	12.07±0.94c

RODRIGUEZ et al. (1994) reported the findings of the total ash content as 0.408% and mean amount of K as 1572 mg/kg in 91 honey samples.

Na and Ca content of the honey belongs to the group 1 were significantly ($p<0.01$) higher than the other groups. The mean value of Na and Ca content of honey from 1 group were found as 27.69 and 127.4 mg/kg respectively. The main reason for these high values could be due to the soil and/or water Ca and Na content because it is known that the soil and water is very rich with Na and Ca in this area. SANZ et al. (1995) reported that, they could determine the honeys obtained from 2 areas of production with different agroclimatic conditions and different flora by using only the parameters of acidity (free acidity and pH) and mineral content with 83% accuracy. Findings of HUSSEIN (1989) were that the mean content of Na and K were 162 mg/kg and 2495 mg/kg in honeys respectively and he also reported that the content of Na and K of honey was different in light and dark coloured honeys.

There was not any significant ($p<0.05$) difference in the total acidity between the flower honeys of group 1 and 2, however there were significant ($p<0.01$) differences in the total acidity between the sugar honey (group 4) and honeydew honey and flower honey (group 1, 2). The total acidity of flower honeys (group 1, 2) was found higher than the acidity content of other honeys (Table 1). According to SALINAS et al. (1994) acidity is one of the main source of variation for different honeys.

Table 2

Classification results of groups

	No of cases	Predicted Group Membership			
		1	2	3	4
Group 1	4	4 (%100)	0 (%0)	0 (%0)	0 (%0)
Group 2	4	0 (%0)	4 (%100)	0 (%0)	0 (%0)
Group 3	4	0 (%0)	0 (%0)	4 (%100)	0 (%0)
Group 4	4	0 (%0)	0 (%0)	0 (%0)	4 (%100)

Discriminant analysis of the parameters of the honey samples showed an affective result to classify the honeys. Different honey groups were clustered separately for all the criteria used (table 2). Although the flower honeys are close to each other it was easy to classify them as these results show that total ash, pH, total acidity and minerals can be reliable criteria to be used to identify the honeys.

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